ONTOLOGY AND THE HISTORY OF ECONOMIC THOUGHT: THE CASE OF ANTI-REDUCTIONISM IN THE WORK OF FRIEDRICH HAYEK

P.A. Lewis

Department of Political Economy
King's College London

paul.lewis@kcl.ac.uk

Cambridge Journal of Economics (special issue in honour of Tony Lawson)
2017: 41 (5): 1343-1365

Abstract

Tony Lawson has long advocated an 'ontological turn' in the history of economic thought. This essay aims to contribute towards that goal by considering how one aspect of the methodology adopted by a prominent heterodox economist was informed by ontological considerations. The economist is Friedrich Hayek, the aspect of his methodology concerns the possibility of reductionism, while the ontological category that informs his anti-reductionist methodology—though not, as we shall see, in a wholly consistent way—is that of 'emergence.' The account presented below suggests that the notion of emergence played an increasingly important, and also increasingly explicit, role in the arguments Hayek mounts against reductionism in his postwar work on theoretical psychology and social theory. In the case of his theoretical psychology, notwithstanding the fact that he had access to a set of concepts that afforded him the opportunity to mount an emergentist case against reductionism Hayek's most prominent argument against reductionism was, and remained, computational—rather than emergentist—in nature. In the case of his mature, post-1960 social theory, however, Hayek explicitly advanced a consistently 'emergentist' case against reductionism, based on the importance of organising relations for the generation of higher-level structural properties such as the coordinative powers of the liberal market economy. The implications of this ontologically-informed discussion of Hayek's arguments against reductionism for existing interpretations of Hayek's work are considered.

ONTOLOGY AND THE HISTORY OF ECONOMIC THOUGHT: THE CASE OF ANTI-REDUCTIONISM IN THE WORK OF FRIEDRICH HAYEK

1. INTRODUCTION[1]

The defining feature of Tony Lawson's approach to the methodology of economics is his concern with social ontology (that is, with the study of nature of social reality). For Lawson, ontology is unavoidable; all social theorists make ontological commitments, if only implicitly, because they presuppose that the methods they use are appropriate for investigating the social world. The key question is whether those commitments are left implicit, or whether they are informed by an explicit attempt to conceptualise the nature of social reality and, in the light of the conclusions reached, to tailor the choice of methods to suit the nature of the social material under investigation, thereby improving the chance of producing insights into the working of the social world (Lawson 1997, 2015a).

Lawson has long argued that the widespread failings of modern, mainstream economics are attributable to its neglect of ontology, and its consequent commitment to methods that are ill-suited to its subject-matter (Lawson 1997, 2015b). His response to this baleful state of affairs has been to advocate an 'ontological turn' in economics, away from approaches—such as the mathematical modelling characteristic of mainstream economics—that are adopted *a priori* and used irrespective of their suitability for the study of social material, towards methods that are tailored to what ontological enquiry indicates *ex posteriori* are the broad contours of social reality (Lawson 2003a: 3-78; also see Lewis 2003, 2004). Significantly, this ontological orientation is shared by much heterodox economics. Many Austrian, Evolutionary, Feminist, Old Institutionalist, Marxist, and Post Keynesian economists emphasise the importance of adopting methods that are tailored to suit the nature of the social material under investigation, pitching both their criticisms of mainstream economics and also the case for their own particular approach to the study of economic life on ontological grounds. Indeed, according to Lawson, it is only by virtue of the fact that the key arguments used by heterodox economists to justify their preferred style of economic analysis presuppose the kind of social ontology set out by Lawson—according to which the social world is open, structured, intrinsically dynamic or processual, and highly internally related—that we have grounds for speaking of a coherent, over-arching *heterodox* project spanning the several schools just listed (Lawson 2003a: 168-83, 2006; also see the essays in Lewis ed., 2004 and Fullbrook ed., 2009).

The ontological orientation of heterodox economics is a long-standing one. Many notable figures in the history of economics, including Commons, Hayek, Kaldor, Keynes, Marx, Menger, Schumpeter, Shackle, and Veblen, whose writing continue to provide inspiration and insights for contemporary heterodox economists, were concerned to adopt methods that fitted with what they saw as the key features of the social world. However, notwithstanding this widespread concern with ontological issues, the study of the ontological conceptions of heterodox economics, whether held explicitly or implicitly, has not featured prominently in modern contributions to the history of economic thought (Lawson 2005, 2015a:

[1] I am very grateful to Jochen Runde and Bruce Caldwell for his helpful comments on an earlier draft of this paper. Three anonymous referees also offered helpful remarks. None of those just listed should be held responsible for any remaining errors and infelicities.

32-33; Arena and Lawson 2015).[2] It is with a view to helping remedy this neglect that the current essay has been written, by considering how one aspect of the methodology of a prominent heterodox economist was informed by his conception of the nature of social being. The economist in question is Friedrich Hayek, the aspect of his methodology concerns the possibility of reductionism, while the ontological category that informs his anti-reductionist methodology—though not, as we shall see, in a wholly consistent way—is that of 'emergence.'

'Emergence' is a fundamental category in Lawson's account of the nature of social reality. Emergent entities arise when a set of pre-existing elements are organised into a particular structure, so that they stand in particular relations to one another (Lawson 2012a: 348-49, 2015a: 21-22, 41-42). The ('higher-level') system or totality that is thereby formed has properties, including causal powers, that are not possessed by the ('lower-level') elements taken in isolation. The properties of the system as a whole are ontologically irreducible to those of its constituent parts in the sense that they would not exist in the absence of that system (that is, if the parts were not organised in the relevant way). As Lawson puts it, "[T]he emergent phenomenon is a system in which components are constrained to act within organising structures … [and so it] includes organising relations that are external to the lower-level elements … [which implies that] the totality is necessarily ontologically irreducible to the lower-level components alone" (2012a: 352). Moreover, if the emergent properties in question include causal powers—understood as the capacity to make a difference to the course of events in the world—then the higher-level system possesses causal powers that are different from those of its parts because, once again, they would not exist if the parts did not stand in the appropriate relations to each other (i.e. causal reductionism is impossible, in the sense that the causal powers of the system are more than simply the sum of the causal powers of its parts taken in isolation). In Lawson's words:

> The argument against causal reducibility is no less straightforward. For it is clear enough that any emergent higher-order forms of efficient causation are precisely powers of the emergent system, and depend as much on the organising structures and relations as on the lower-level components that the latter organise. (Lawson 2012a: 352.)

The importance of the relational organisation of the parts for the existence of the emergent causal power implies, moreover, that emergent entities cannot be excised from causal explanations that depend on the exercise of their system-level causal powers. That is to say, an eliminative reduction of the emergent entity—whereby references to it are entirely replaced by, or reduced to, statements about the properties of its isolated component parts—is not possible. The reason is that, as noted above, any causal explanation that rests upon the exercise of the system-level powers depends not only upon the properties of those parts but also upon the way in which they are related to each other when they form the emergent entity in question; the emergent properties arise, and have the causal effects they do, only because of the manner in which their individual parts are organised. Causal explanations that invoke such powers therefore depend critically upon something more than the properties of the isolated individual elements, namely the relations in which those elements must stand to one another in order for the emergent causal power in question to obtain. And it is because of the need to refer to the requisite organising structures and

[2] For some exceptions, mostly produced by scholars associated with the Cambridge research group founded by Lawson, see Fleetwood (1995, 1996, 2001), Graça Moura (2002, 2004, 2015), C. Lawson (1994, 1999, 2015), T. Lawson (1995, 1996, 1997, 2003b, 2015c), Latsis (2015), Lewis and Runde (2007), Lewis (2008, 2012, 2015a, 2016a, 2016b), Martins (2015), Montes (2003), Pratten (1993, 1998), and Runde (2001).

relations that eliminative reduction is impossible, and the autonomy of separate disciplines—of psychology, say, or economics, each with its own concepts that are not merely placeholders for those used in physics—is sustained (Lawson 2012a: 350-53, 2015a: 40-41; also see Elder-Vass 2010: 24-25, 54-58).[3]

The issue of reductionism, and the associated ontological category of 'emergence', feature prominently in Hayek's reflections on the methodology of the human sciences. In his theoretical psychology, as we shall see, he sought to counter eliminative reductionist claims that human behaviour can be explained solely in physical terms, in order to provide a warrant for his own preferred subjectivist approach to economics. In his mature social theory, as exemplified by his writings on social order in the 1960s, he rejected the view that the operation and development of the market system are best understood solely in terms of the actions and properties of individual people. At times, but not always, his case against reductionism was underpinned by an explicit commitment to an emergentist ontology according to which the mind and the market are organised systems of elements that are irreducible—ontologically and causally, and therefore also explanatorily—to their isolated individual parts. And in giving an account of Hayek's views on reductionism, and on his use of the ontological category of 'emergence' to justify them, the sections that follow aim to illustrate the value of an ontological orientation for the history of economic thought, both by drawing attention to hitherto neglected aspects of Hayek's own use of ontological thinking to justify aspects of his (anti-reductionist) methodology and also by correcting some misinterpretations of his work by other commentators.

2. ANTI-REDUCTIONISM IN HAYEK'S THEORETICAL PSYCHOLOGY

2.1 *The Sensory Order*: A Brief Summary

In order to examine how the issue of reductionism arises in Hayek's theoretical psychology, we need first of all briefly to outline the account of the working of the mind set out in *The Sensory Order* (Hayek 1952).[4] Hayek's main goal in that book is to explain why the subjective, mental picture of the world provided by our senses differs from the physical order revealed to us by the natural sciences. Objects that seem similar to us, in the sense of looking or sounding the same, often display very different physical relations to each other, while objects that appear altogether different display similar physical properties. There are, as Hayek puts it, two different orders: a physical order, which is revealed to us by the natural sciences; and a phenomenal, or mental or sensory, order that we experience as individuals. The task of theoretical psychology, as Hayek conceives it, is to explain how the neurons out of which the human central nervous system is composed form a classificatory structure that is capable of discriminating between different physical stimuli so as to give rise to the sensory order we actually experience (Hayek 1952: 2-8, 13-19, 37-40).

For Hayek, the human central nervous system consists of a hierarchical network of interconnected nerve fibres. Neurons can generate outgoing electrical impulses, or 'fire', if they are stimulated sufficiently by incoming impulses, and it is through the transmission of such impulses that neurons interact with each another (Hayek 1952: 42, 55-64). Nerve fibres in which impulses often occur together

[3] For an account of the nature of the discipline of economics that follows from these claims, see Lawson (2003a: 141-64).

[4] For longer summaries of Hayek's theoretical psychology than considerations of space permit here, see Runde (1988), Butos and Koppl (2006) and Lewis (2012: 370-73, 2017: 7-9, 13-21).

tend to become connected to each other, so that over time the nervous system acquires a structure, in which the position of any one neuron is defined by its connections to other nerve fibres. And it is this structure that accounts for the key features of our mental experiences. The reason is that the (primary) nerve impulse generated by a particular external stimulus in turn stimulates neurons connected to those along which that primary impulse travels, so that the stimulus leads to the creation within the nervous system of a set of (secondary) nerve impulses, termed by Hayek the *following* of the initial impulse. External events are classified as the same, and are experienced as having the same sensory qualities, if they trigger an identical following (Hayek 1952: 48-54, 62-78).

In short, for Hayek, external events stimulate the growth of an organised structure of nerve fibres that reproduces, albeit only imperfectly, the patterns of events occurring in the external environment, with the structure of connections between the neurons corresponding topologically to the structure of the relations between external events. Indeed, on Hayek's account, the neural order—that is, the set of connections between nerve fibres in the brain, and the impulses proceeding in them—that is produced in this way just is the sensory order or phenomenal experience (Hayek 1952: 40). Ultimately, according to Hayek, the chain of impulses initiated by an external stimulus leads—via a neurophysiological process whose ultimate outcome depends not only on the stimulus in question but also upon the pattern of impulses that was already being transmitted the person's nervous system at the time stimulus in question was received—to the triggering of various dispositions or propensities to act in particular ways (Hayek 1952: 79-96, 112-27, [1969] 2014: 317-21, 1982: 289-90).

2.2. Hayek's case against reductionism in theoretical psychology

For Hayek, then, the structure of interconnected neurons in the nervous system acts as an instrument of classification, discriminating between incoming stimuli and thereby creating the sensory qualities, or mental events, people experience (Hayek 1952: 16, 35). However, although he gives an account of the processes through which the operation of that classificatory apparatus generates sensory qualities, Hayek does not believe that it is possible to reduce mental phenomena to physical ones in the sense of being able to substitute descriptions of physical facts for references to mental entities—such as concepts, belief, and purposes—in our analyses of human conduct: "We are not in a position", Hayek ([1943] 2010: 110) claims, "to substitute objects defined in physical terms for the mental categories we employ in talking about other people's actions."

Hayek's case against eliminative reductionism is first set out prior to the publication of *The Sensory Order*, in 1943, in the second of his three essays on 'Scientism and the Study of Society' (Hayek [1943] 2010: 108-14).[5] Hayek's goal in that essay, as indeed it was in his later book, was to undermine claims, advanced by the advocates of behaviourist psychology and physicalist philosophy of mind, that all references to mental entities, such as 'concepts', 'ideas' and 'purposes', should be expunged from the scientific analysis of human action, to be replaced by references to objects defined in purely physical terms. In seeking to counter such views, Hayek deployed what might be described as a computational argument. Starting from the premise that all mental phenomena "must be regarded as acts of classification performed by the brain", Hayek then argues that "any apparatus of classification would always have to possess a degree of complexity greater than any one of the different things which it classifies." It follows

[5] As Hayek later reminisced, "In the early 1940s, I had done a study of what I christened 'scientism'—that is, an examination of the harmful effects that the physics model had had on the methodology of the social sciences—and in this work had been driven both to rely in some measure on the results of my unpublished work in psychology and to think through some of the problems with which I had dealt in this" (1982: 289).

that the brain will be unable to produce a complete physical classification of its own operations, so that the goal of "fully reducing all mental phenomena to physical processes" cannot be achieved. On this view, Hayek claims, anyone who advocates reductionism will fall foul of "the paradox that to 'explain' our own knowledge would require that we should know more than we actually do, which is of course a self-contradictory statement" (Hayek [1943] 2010: 110-13).[6]

Hayek advances a more detailed version of the same anti-reductionist argument in the final pages of *The Sensory Order* (1952: 184-90). Having established that explanation is a form of classification or model-building, Hayek repeats the argument that because any apparatus of classification must possess a structure of a higher degree of complexity than is possessed by the objects it classifies, "the capacity of any explaining agent must be limited to objects with a structure possessing a degree of complexity lower than its own". The human brain will therefore be incapable of fully comprehending itself, so that in describing its functioning it will be unable to "substitute a description in physical terms for a description in terms of mental qualities" (Hayek 1952: 185, 189). Hayek summarises the significance of his argument as follows:

> The conclusion to which our theory leads is that not only the mind as a whole but also all individual mental processes must forever remain phenomena of a special kind which, although produced by the same principles which we know to operate in the physical world, we shall never be able fully to explain in terms of physical laws. Those whom it pleases may express this by saying that in some ultimate sense mental phenomena are 'nothing but' physical processes; this, however, does not alter the fact that in discussing mental processes we will never be able to dispense with the use of mental terms, and that we shall have permanently to be content with a practical dualism … based not on any assertion of an objective difference between the two classes of events, but on the demonstrable limitations of the powers of our own mind fully to comprehend its own operations. (1952: 191.)

It follows, therefore, that "in the study of human action … our starting point will always have to be our direct knowledge of the different kinds of mental events, which to us must remain irreducible entities" (1952: 191).[7]

However, as we shall see, this computational argument against eliminative reductionism and in favour of a subjectivist approach to social science sits somewhat uneasily with one of the other ways in which Hayek portrays the relationship between mental and physical events, namely in terms of the notion of 'emergence'.

2.3. Hayek's theoretical psychology, emergence, and the influence of Organicist Biology

In four paragraphs (2.27-2.30) added to the manuscript of *The Sensory Order* between 1948 and 1952,[8] Hayek elaborates on the relationship between the sensory qualities people experience, and the neural events that give rise to them, by noting that while "neural event[s] may have physical properties … which they possess by themselves", mental properties, such as the capacity to give rise to certain kinds of

[6] For other accounts of Hayek's computational argument, which relate it to modern developments in computational complexity, see Koppl (2009) and Rosser (2015: 598-600).

[7] Hayek advances similar arguments in Hayek [1964] 2014: 274, [1962] 2014: 250-52, [1969] 2014: 335-36, and 1982: 292.

[8] For a brief account of the different drafts of *The Sensory Order*, see Lewis (2016c: section 3.2).

sensory experience, are those which neural events "possess only as a part of the particular structure … we call mind" (Hayek 1952: 46-47). Hayek further states that the relationship between mental and physical properties thus described can be understood using the concept of "organisation" and the notion of "structural properties" (1952: 47). These ideas are to be understood, Hayek continues, as they are explained in the work of the theoretical biologists Joseph Woodger (1929) and Ludwig von Bertalanffy (1950, 1952).

Bertalanffy and Woodger were writing in the 1920s, at which time biology was in the thrall of the so-called mechanism-vitalism controversy. Mechanists argued that biological systems are best understood by reducing them to their smallest constituent parts, namely micro-physical particles. Vitalists argued in contrast that biological phenomena can only be understood if it is acknowledged that there exists some supernatural force, existing independently of the material world, that animates and gives life to the biological world. Bertalanffy and Woodger argued that both of these approaches are flawed: mechanism because it fails to do justice to the importance of the relations obtaining between micro-physical particles for understanding biological phenomena; and vitalism because it amounts to a renunciation of efforts to explain scientific explanation of biological data (Bertalanffy 1933: 46, 45) (Bertalanffy 1933: 28-32, 43-50, 177-78, 188, 1952: 1-9; Woodger 1929: chapter 5, 275, 286-99).[9]

Bertalanffy and Woodger sought to transcend the terms of this debate by developing a conception of the biological world that, by emphasising the importance of the structural relations obtaining between the parts of an organism, would avoid the shortcomings of mechanism without lapsing into metaphysical excesses of vitalism. Their alternative 'organismic' conception of the biological world would, they believed, do justice to the importance of the structural relations obtaining between the parts of biological organisms for their properties and behaviour, whilst also facilitating the scientific but non-reductionist analysis of biological phenomena. At the heart of their approach were four concepts, including the two mentioned by Hayek: the concept of a 'system'; the notion of 'organisation'; the concept of 'structural' or 'emergent' properties; and the idea that the world is 'hierarchical' in the sense of being composed of entities existing at different 'levels of organisation'. Taken together, these concepts formed an intellectual framework that underwrote a non-reductionist approach to biology that sought to find biological laws that were quite distinct from, and irreducible to, the laws of physics and chemistry.

A 'system' is a set of parts or elements that are related to one another in a particular way. The notion of 'organisation' denotes the way in which individual parts must stand in certain relations to one another, forming a particular structure, if a certain kind of system—such as a living system—is to obtain. Individual elements behave differently when they are arranged into structures than when they act in isolation, implying that systems can display 'structural' or 'emergent' properties that are quite different from—and are ontologically irreducible to—the properties of the individual parts. It follows that there are distinct ('higher-level') biological laws describing the behaviour of emergent biological systems that cannot be reduced to, or replaced without loss of understanding by, the ('lower-level') laws of physics and chemistry. In other words, the organicist biologists were not only anti-reductionist in an ontological sense but also explanatorily, arguing that the importance of the organising relations between the parts of a biological organism for explaining its properties and behaviour underwrites the epistemological independence or autonomy of biology *vis-à-vis* chemistry and physics (Bertalanffy 1950: 139-40, 143, 1952: 11, 148-57, 181, Woodger 1929: 283-99, 310-17).

[9] For longer accounts of Bertalanffy and Woodger's ideas, see Lewis (2016a: section 4.1) and Lewis (2016b: section 2).

In drawing on the work of Bertalanffy and Woodger, therefore, Hayek is giving an emergentist account of the relationship between mental and physical events—that is, between mind and body—implied by his theoretical psychology. This philosophical gloss fits in well with Hayek's substantive account of the creation of the sensory order because, as we have seen, Hayek's theory is structural or relational in nature; it is only because people's nerve fibres are organised in such a way that some stimuli gave rise to different 'followings' that discrimination between stimuli, classification, and perception are possible.[10] Hayek's substantive theory implies, therefore, that the capacity to classify stimuli is an emergent property of the structured array of neurons in the brain, ontologically irreducible to the properties of the individual neurons, which is of course consistent with his appeal to the ideas of Bertalanffy and Woodger.[11]

2.4. Hayek's arguments against reductionism: A tension

What this suggests is that by the early 1950s Hayek had adopted most of the key elements of the conceptual framework developed by the organicist biologists, in particular the notions of 'system', of 'organisation', of 'emergence', and of the 'hierarchical' nature of reality. However, there is one important way in which Hayek deviates from the arguments used by Woodger and Bertalanffy, a divergence that seems a little anomalous in the light of his otherwise consistent accord with their views. Significantly for the topic of this paper, the deviation concerns reductionism. As noted above, central to Bertalanffy and Woodger's argument against reductionism is the idea that the properties and behaviour of organised wholes depend not just upon the properties of the elements out of which they are composed, but also on the way in which those elements are organised into certain kind of structure. However, as we have also seen, while Hayek reaches the same kind of anti-reductionist conclusion as the organicist biologists, he uses a very different kind of argument to justify his position, basing his case against eliminative reductionism, not on emergentist arguments of the kind advanced by Bertalanffy and Woodger, as one might expect given his reliance on other aspects of their framework, but rather on the computational argument outlined above.

The reason why Hayek relied on the computational argument against reductionism in his theoretical psychology is not entirely clear. One possibility is that he developed the computational argument first and that, having done so, he felt no need to supplement or replace it with an emergentist critique of reductionism of the kind developed by Woodger and Bertalanffy. Hayek first advanced the computational argument in his 1943 *Economica* article on scientism.[12] But he did not appear to engage

[10] In Hayek's own words, "The connections between the psychological elements are thus the primary phenomenon which creates the mental phenomena ... the whole set of [sensory qualities evoked by an external stimulus] is determined by the system of connections by which the impulses [generated by that stimulus] can be transmitted from neuron to neuron ... it is thus the position of the individual impulse or group of impulses in the whole system of such connections which gives them its distinctive quality" (Hayek 1952: 53).

[11] Additional textual evidence supporting the claim that, not least because of the influence of Bertalanffy and Woodger, Hayek was adopting an emergentist perspective on the relationship between mental and physical events can be found in one of his later essays on theoretical psychology, where Hayek explicitly states that he uses the term 'system' "in the sense in which it is used in von Bertalanffy's 'General System Theory" (Hayek n.d.: 4). Systems of this kind, Hayek continues, are "organised" into "a structure" that has a "hierarchy of levels" (pp. 5, 7, 10). Further evidence is detailed in Lewis (2016a, 2016b).

[12] The source of Hayek's computational argument remains obscure. It should be noted that, while Hayek often compared his argument to the so-called Gödel incompleteness theorem—according to which there are statements about a formal system that are true but which cannot be explained in terms of the logic of that system, so that in a sense the system cannot 'understand' itself—those references did not appear in Hayek's work until 1962 (that is, almost twenty years after he first advanced the argument) (Hayek [1962] 2014: 252, [1969] 2014: 335-36, 1982: 292). It seems unlikely, therefore, that the origins of Hayek's argument are to be found in his reading of Gödel. Rather, Hayek's references most probably reflect his *ex post* recognition of similarities between an argument he had already developed and Gödel's theorem. In the first place where Hayek refers to Gödel, he references a "semi-popular exposition" of the theorem, namely Nagel and Newman (1958) (Hayek [1962] 2014: 252, n. 51). One might very tentatively conjecture that it is from reading that book that Hayek first came across Gödel's ideas.

seriously with Woodger and Bertalanffy's work on emergence until the late 1940s. Hayek does not mention the work of Bertalanffy at all until the final draft of *The Sensory Order* (as described above).[13] He does refer very briefly to Woodger's work in the course of a discussion of teleological explanations in biology found in the third part of his *Scientism* essay, published in 1944 (i.e. the year after he had first outlined his computational argument in print) (Hayek [1944] 2010, p. 143 n. 4). But while Hayek does mention the notion of 'organisation' in the footnote in which the reference to Woodger comes, he does not elaborate on that concept. Nor does he refer to the notion of 'emergence' or its significance for the possibility of reductionism. It may therefore be the case, though this can be no more than a tentative conjecture, that Hayek did not read the work of Woodger and Bertalanffy, and appreciate the significance of their anti-reductionist arguments, until after he had first developed his computational argument against eliminate reductionism. And it may also be the case that, because by the time he had engaged seriously with Woodger and Bertalanffy's ideas about emergence—in the late 1940s, in the course of completing his final revisions to *The Sensory Order*—Hayek had already advanced his computational argument against reductionism, he did not feel the need to develop another, emergentist one.

The fact that ultimately, in the final version of *The Sensory Order*, Hayek marries an emergentist account of the relationship between mental and physical events to a computational argument against reductionism does not, on face value, signify a contradiction in Hayek's work. After all, both the computational and emergentist arguments lead to the same conclusion, namely that efforts to eliminate references to mental entities from accounts of human behaviour are misguided. But it is, perhaps, symptomatic of an underlying tension in Hayek's theoretical psychology between the influence of mechanistic/atomistic and biological/organicist perspectives. The influence of the mechanistic worldview can be seen at the outset of Hayek's first exposition of the computational argument against reductionism, where he describes classification as "a mechanical process … which could be performed by a machine which 'sorts out' and groups objects according to certain properties" ([1943] 2010: 112). But Hayek's use of mechanical metaphors, and comparisons between the operation of the brain and the working of machines, to illustrate his theoretical psychology only increased through successive drafts of *The Sensory Order*, as he began to integrate ideas from cybernetics into his analyses both of human action and also of explanation (including the extended account of the computational argument summarised above) (Hayek 1952: 126, 188-89) (Lewis 2016c). The hallmark of cybernetics is its use of self-correcting machines such as guided missiles and anti-aircraft gun predictors as models for purposeful human action. As I have recounted in more detail elsewhere, Hayek's attempts to show how his account of the mind as a classificatory apparatus, which he initially used only to explain the creation of sensory qualities and emotions, can be extended to illuminate the neurological mechanisms underpinning purposeful human action, saw him draw on the work of some of the founding fathers of the discipline of cybernetics, most notably Norbert Wiener, Warren McCulloch, and Ross Ashby (Lewis 2016c, 2016d).

The problem created by this use of cybernetics, however, as historian of cognitive science Jean-Pierre Dupuy (2009: 6, 7) has put it, is that, especially as embodied by the work of the authors just listed, cybernetics is "resolutely 'eliminativist'" in the sense that, "the mental states invoked by ordinary or 'folk' psychology to account for behaviour—beliefs, desires, will, intentions—were to be banned from

[13] Evidence suggests that Hayek met Bertalanffy in August 1947 and that the two men began to correspond from that time. A comparison of the various drafts of *The Sensory Order* suggests that Hayek began to incorporated insights from organicist biology into his work from 1948 onwards (Lewis 2016b).

scientific explanation" (Dupuy 2009: 49).[14] In drawing on cybernetics, therefore, Hayek was importing into his theoretical psychology an approach that was more mechanistic, and more inclined towards reductionism, that his own. Such considerations lie behind the doubts that commentators such as Caldwell (2004: 300) and Mirowski (2007: 366) have expressed about whether Hayek's theoretical psychology, to the extent that it relies on ideas drawn from cybernetics, is able to do justice to importance of the subjective aspects of purposeful conduct. Such concerns are troublesome for someone like Hayek, one of whose goals in *The Sensory Order* was of course to develop a psychological foundation for his preferred subjectivist approach to economics.

There is, then, a tension in Hayek's theoretical psychology, reflecting the sometimes countervailing implications of the sources on which he was drawing, with the organicist and emergentist tendencies encouraged by the influence of Bertalanffy and Woodger amongst others sitting somewhat uncomfortably with the more mechanistic, and even reductionist, tendencies of cybernetics. As we shall see, however, the influence of anti-reductionist arguments became more prominent in Hayek's social theory in the 1950s and 1960s, as Hayek more thoroughly embraced emergentist ideas. Indeed, as we shall also argue, Hayek's increasingly emergentist approach to social theory arguably even feed back to his theoretical psychology, reinforcing the anti-reductionist elements in that part of his work.

3. ANTI-REDUCTIONISM IN HAYEK'S SOCIAL THEORY

3.1 A brief overview of Hayek's 'mature' account of the possibility of social order

We move on now to consider how questions of anti-reductionism arise in Hayek's social theory and, in particular, his account of how social order is possible in decentralised market economies. Hayek established in 1937 that the key question for understanding the generation of social order concerns how people acquire the knowledge required to form mutually compatible plans when that knowledge is dispersed throughout the economy as a whole rather than being concentrated in the mind of one individual (Hayek [1937] 2014). As Hayek ultimately came to realize, the dissemination of knowledge required for plan coordination is facilitated not only by price signals, as discussed in his famous 1945 paper on the significance of freely-formed market prices (Hayek [1945] 2014), but also by a set of shared social rules, including both formal and informal rules such as the laws of property, tort and contract, and norms of honesty and promise-keeping, respectively.[15] By facilitating enforceable contracts, the rules in question enable people to devise and act upon plans confident that the contributions from other people required to bring those plans to fruition will be forthcoming.[16]

---

[14] See, for example, Ashby (1949: 721), who claims that cybernetics involves the notion of 'purpose' being replaced by physical concepts: "Cybernetics … treats these actions [by people on the external world] … by methods which rest not on the metaphysical concepts of purpose, instinct, and libido, but on the physical concepts of structure, energy and dynamics." Similar views were expressed by McCulloch and Walter Pitts, according to whom "both the formal and the final aspects of that activity which we are wont to call *mental* are rigorously deducible from present neurophysiology … [so that] 'Mind' no longer 'goes more ghostly than the ghost'" (McCulloch and Pitts 1943: 132).

[15] For more on the development of Hayek's thought on these issues, see Fleetwood (1995), Lawson (1996, 1997, 2005: 538-42), Vaughn (1999) and Lewis (2014).

[16] "What makes men members of the same civilization and enables them to live and work together in peace is that in the pursuit of their individual ends the particular monetary impulses which impel their efforts towards concrete results are guided and restrained by the same abstract rules. If emotion or impulse tells them what they want, the conventional rules tell them how they will be able and be allowed to achieve it" (Hayek 1976: 12).

In the following two sections, we consider how Hayek's analysis of the problem of social order developed, paying particular attention to the issue of reductionism.

3.2 Hayek's Analysis of Social Order in the 1940s: The Compositive Method

We saw earlier, in Section 2.1, that Hayek was concerned in the early-to-mid 1940s to establish that it is impossible to replace references to mental entities—such as concepts, opinions, and purposes—by descriptions couched solely in terms of physical facts without significant loss of cognitive content. The purpose of this anti-reductionist argument is, of course, to bolster's Hayek's subjectivist approach to social science, according to which in analysing social phenomena of interest it is essential to understand how the people under investigation understand and interpret their circumstances: "Not only man's action towards external objects but also all the relations between men and all the social institutions can be understood only by what men think about them. Society as we know it is, as it were, built up from the concepts and ideas held by the people; and social phenomena can be recognised by us and have meaning to us only as they are reflected in the minds of men" (Hayek [1942] 2010: 97; also see pp. 88-98).[17]

The method that Hayek deploys in order to understand how people's subjective understandings of their circumstances are transformed, via their actions, into social phenomena of interest is known as compositive social theory (Hayek [1942] 2010: 99-107). This involves the social scientist providing an account of the sets of social relations that must obtain between people if, when they act in a purposeful way in the light of their interpretation of their circumstances, some social phenomena of interest—such as "the compatibility of intentions and expectations across different people" characteristic of social order—is to be produced (Hayek [1942] 2010: 96).

More specifically, while Hayek argues that the social scientist "must … systematically start[.] from the concepts which guide individuals in their actions" ([1942] 2010: 100), social scientific analysis does not on his account end once those concepts have been identified. It does not, in particular, involve some form of 'hermeneutic reductionism', whereby social phenomena of interest consist of nothing more than, and so can be explained solely in terms of, people's conceptions of them. On the contrary, for Hayek, the identification of people's ideas marks only the beginning of the analysis. For having identified how people understand and so respond to their circumstances, social scientists must then engage in "a deliberate effect of directed thought", whereby they consider "the structure of possible relationships between individuals", in order to identify "the necessary effects of the combination of such actions" such as, in the case of the market economy, "how the independent actions of individuals will produce an order which is no part of their intentions" (Hayek [1942] 2010: 104, 103; also see p. 98). In the case of the social order in decentralised market economies, as Hayek notes elsewhere, the key requirement is that people's (inter)actions should be structured by a "permanent framework of laws" which, by setting out how people must relate to one another if they enter into certain kinds of contract, "could almost be described as a kind of instrument of production, helping people to predict the behaviour of those with whom they must collaborate" and thereby—in conjunction with relative price signals—facilitating the coordination of their plans (Hayek [1944] 2007: 113).

[17] Referring to the case of economics in particular, Hayek writes along these lines as follows: "[I]t is probably no exaggeration to say that every important advance in economic theory during the last hundred years was a further step in the consistent application of subjectivism. That the objects of economic theory cannot be defined in objective terms but only with reference to a human purpose goes without saying … Unless we can understand what acting people mean by their actions any attempt to explain them, that is to subsume them under rules which connect similar situations with similar actions, is bound to fail" (Hayek [1942] 2010: 95).

On this view, the key contribution of social theory—indeed, the only reason why there is any need for social theory at all—is to show how, if people's interactions are characterised by a particular set of social relations, so that their actions combine in a particular pattern, they will produce unintentionally produce some social phenomenon of interest. In Hayek's words:

> It is the so-called wholes, the groups of elements which are structurally connected, which we have learned to single out from the totality of observed phenomena ... [and which] are the condition for the achievement of many of the things at which we as individuals aim, the environment which makes it possible even to conceive of our individual desires and which gives us the power to achieve them. (Hayek [1942] 2010: 102-03, [1944] 144.)

And by identifying the patterns of social relations through which people must act in order for certain kinds of social outcome to be possible, Hayek tells us, social theory "often leads to the *discovery* of principles of structural coherence of the complex phenomena which had not been (and perhaps could not be) established by direct observation". In this way, "the social sciences no less than the natural sciences aim at revising the popular concepts which men have formed about the objects of their study, and at replacing them by more appropriate ones" ([1942] 2010: 101, 99; also see p. 98).[18]

In outlining this methodology, then, Hayek is seeking to avoid a reductionist approach to social science. The 'wholes' to which Hayek refers are "persistent structure[s] of relationships" which "can remain the same although different individuals succeed each other … in particular relations" ([1944] 2010: 143, [1942] 2010: 97) On his account, explanations of social phenomena involve not only references to how people interpret and understand their circumstances, but also to the social relations that, by organising how people's actions combine with each other, constitute the causal mechanism through which those actions lead to social outcomes (Runde 2001: 13-16). There are, however, two, arguably related, ambiguities in Hayek's account, both of which can be seen in the following quote from the third instalment of Hayek's 'Scientism' essay:

> [I]t is only by the individualist or compositive method that we can give a definite meaning to the much-abused phrases about the social processes and formations being in any sense 'more' than 'merely the sum' of their parts, and that we are enabled to understand how structures of inter-personal relationships emerge, which make it possible for the joint efforts of individuals to achieve desirable results which no individual could have planned or foreseen. (Hayek [1944] 2010: 147.)

First, while Hayek's reference to the way in which the compositive method makes it possible to "give a definite meaning to" the idea that social wholes are more than the sum of their parts, he does not actually spell out clearly and explicitly what that definite meaning actually is. Second, there are times where Hayek fails to distinguish clearly between two related but distinct tasks in social theory: the explanation of how, when people's interactions are structured by a *given* set of social relations of a certain kind, their actions yield unintended outcomes; and the explanation of how the relevant sets of social relations arise in

[18] Put another way, Hayek is arguing that the goal of social theory is to identify the causal mechanism through which social phenomena of interest are produced (Hayek [1943] 2010: 112, 143; also see Hayek [1967] 2014: 287). A 'mechanism' can be defined as a way of acting or working of a structured entity. Mechanisms possess the causal power to generate certain types of outcomes in virtue of the way in which their component parts are arranged and relate to one another (that is, in virtue of their structure) (Lawson 1997: 21).

the first place. In the first case, the social relations are the *explanans*, while in the latter they are the *explanandum*. Indeed, the passage just quoted exemplifies the point, with Hayek writing there both about how "structures of interpersonal relations make it possible for the joint efforts of individuals to achieve certain desirable results", in which case those relations act as the *explanans*, but also how those relations arise or "emerge", in which case they are the *explanandum*. Similarly, when in the 'Facts of the Social Sciences', Hayek writes that the attitudes and actions of men "are the elements from which the social sciences build patterns of relations between many men", it is unclear whether this involves the social scientist postulating a particular set of social relations which, if it existed, would explain social outcomes of interest, or whether he also means that he wishes to explain the process through which those relations arise (Hayek [1943] 2014: 80).

One might conjecture that the reason for these ambiguities lies in the absence from Hayek's conceptual repertoire at this stage of his career, namely the early-to-mid 1940s, of the ontological category of 'emergence'. By the late 1940s, however, Hayek had acquired from his reading of the work of Bertalanffy and Woodger a set of ontological categories, including the notions of 'organisation', 'system', and 'structural' or emergent properties, that filled this gap in his conceptual scheme. It will be argued below that, having acquired those new categories, Hayek was able to deploy them both in order to explain how social wholes are more than the sum of their individual human parts, and also—not least by using the notion of 'emergence'—to give a clearer account of the two different ways social relations can figure in social-scientific explanations.

Considerations of space preclude a detailed justification of the claim that it is from the work of Bertalanffy in particular that Hayek imported those categories into his social theory. The interested reader can consult Lewis (2016b) for details. Rather than providing a historical account of how those concepts made their way into Hayek's work, the next section considers their significance for Hayek's mature thinking about questions of reduction in social science and shows how, by using them, Hayek was able to resolve the two ambiguities described above.

3.3 Reduction and emergence in Hayek's post-1950 social theory

Hayek relates his account of social order to the topic of reductionism in an important essay, published in 1967 and entitled, "Notes on the Evolutions of Systems of Rules of Conduct". At the outset of that essay, he states that his goal is to "make clear the important distinction between the systems of rules of conduct which govern the behaviour of the individual members of a group … on the one hand and, on the other hand, the order or pattern of actions which results from this for the group as a whole" (Hayek [1967] 2014: 278). By the 'order of actions', Hayek means the capacity of the price mechanism to bring people's plans into harmony and thereby facilitate social order. It is, Hayek writes, "more than the totality of regularities observable in the actions of the individuals and cannot be reduced to them ... It is more than the mere sum of its parts but presupposes also that these elements are related to each other in a particular manner" ([1967] 2014: 282). Hayek makes the same point elsewhere in the same essay, arguing that the case of social order is one where "some regularity in the behaviour of the elements produces … a wholly different regularity in the actions of the whole" that "cannot be … reduced to the regularities of the parts" (pp. 289, 286). In other words, for Hayek, the coordinative power of the market system is ontologically distinct from, and irreducible to, the properties of the people who inhabit it. Hayek underlines the ontologically irreducibility of the overall order of actions in another essay, published just a few years after

the one just mentioned, where he writes that, "The order of society is therefore a factual state of affairs which must be distinguished from the regularity of the conduct of individuals" ([1970] 2014: 344).

Hayek lists a variety of considerations that, he believes, support his contention that the coordinative power of the price mechanism is ontologically irreducible to people's actions. One is the fact that not every system of rules of conduct will produce an overall order of actions. A second is that the same overall order of actions may be produced by different systems of rules of individual conduct. (A third consideration will be mentioned below.) It is possible to make sense of these facts, Hayek contends, only by acknowledging that "the system of rules of individual conduct and the order of actions that results from the individuals acting in accordance with them are not the same thing" (that is, by acknowledging the existence of an ontological distinction between rules and individual actions, on the one hand, and the emergent power to coordinate people's plans, on the other) (Hayek [1967] 2014: 279, 287-79).[19]

In arguing both that the coordinative power of the price mechanism obtains only when people's actions are in conformity with certain systems of rules, and also that it is irreducible to those rules, Hayek is of course suggesting that the power in question is an emergent property; it is emergent because it is possessed only by a particular "whole" (Hayek [1964] 2014: 262)—in Lawson's (1997: 64, 166, 2015a: 35-36) terminology, a 'totality'— namely a society where people's interactions are governed and structured by the appropriate system of rules (and not by those individuals either taken in isolation or by a group whose conduct is governed by an inappropriate set of rules). In exhibiting emergent properties, the free market system exhibits one of what Hayek regards as one of the defining characteristics of structures displaying what Hayek describes as 'organised complexity', namely that "the character of the structures … depends not only on the properties of the individual elements of which they are composed … but also on the manner in which the individual elements are connected with each other" (Hayek [1975] 2014: 365). In such cases, "a certain combination of [elements] … produces an overall structure possessing distinct characteristic properties":

> The "emergence" of "new" patterns … means that this larger structure will possess certain general or abstract features which will recur independently of the particular values of the individual data, so long as the general structure … is preserved. (Hayek [1964] 2014: 261-62.)

What we can see here, then, is Hayek using the notion of emergence to address the first of the ambiguities identified in his social theory of the early-to-mid 1940s, namely his uncertainty about what is meant by the idea that social wholes are more than the sum of their parts. By the 1950s and 1960s, having acquired the concepts of 'organisation', 'system', and 'emergence', Hayek could say that social wholes are more than the sum of their parts in the sense that, when people's governed by a particular system of social rules, so that they stand in certain relations to one another, the system or whole thereby formed possesses properties that are ontologically irreducible to the properties of those individuals (cf. Lawson 2012a: 359-76, 2015a: 35-42).

Significantly, according to Hayek, one of the key criteria for judging whether or not a particular whole is of interest to social science is whether the emergent properties to which it gives rise are such that the structure in question will persist over time: "The coherent structures in which we are mainly interested," Hayek ([1964] 2014: 262) contends, "are those in which a complex pattern has produced

[19] For additional reasons why Hayek views the rules as a *system* in Bertalanffy's sense of that term, see Lewis (2016b: section 3).

properties which make self-maintaining the structure showing it."[20] This brings us to a third consideration that, in Hayek's view, testifies to the importance of acknowledging the irreducibility the overall order of actions, namely that "[i]t is the … overall order of actions but not the regularity of the actions of the separate individuals as such which is important for the preservation of the group" ([1967] 2014: 280).

> For the understanding of animal and human societies the distinction [between the overall order of actions and the properties of individuals] is particularly important because … what may be called the natural *selection* of rules will operate on the basis of the greater or lesser efficiency of the resulting *order of the group*. (Hayek [1967] 2014: 279).

Different systems of rules structure the actions of the members of the various groups and, in virtue of their collective capacity to generate the emergent capacity to coordinate people's plans, determine the success of those groups in the process of competition through which selection occurs. Groups whose activities are structured by sets of rules that generate the emergent capacity to coordinate people's actions will produce the wealth required to attract and sustain higher populations, while groups that do not adhere to such rules will decline in size and ultimately be eliminated. For Hayek, then, it is in virtue of their capacity to generate the emergent causal power to coordinate people's actions without centralised direction that groups—and, more specifically, the systems of rules that characterise them—are selected in the process of social evolution. In this way, as Hayek puts it, "The evolutionary selection of different rules of individual conduct operates through the viability of the order it will produce … [so] that systems of rules of conduct will develop as wholes" (Hayek [1967] 2014: 280, 283) (Gaus 2006 and Lewis 2015a).[21]

The ontological and causal irreducibility of the order of actions in turn underwrites the explanatory irreducibility of the system of rules that underpins that emergent property. Hayek's goal in developing his theory of cultural evolution is to explain how modern market economies arose in the absence of conscious direction (Hayek [1967] 2014: 279). His explanation is, as we have seen, one that centres on variations in the capacity of different kinds of group or society to generate the emergent causal power to coordinate people's actions in the absence of centralised direction (and thereby to decentralise decision-making and so make use of as much dispersed, tacit knowledge as possible). But the causal power in question is irreducible both to the properties of the individual rules taken in isolation and also to the attributes and actions of the people who populate the group in question. It follows that the emergent social wholes—the groups and, more specifically, the systems of rules by reference to which those groups are defined—cannot be eliminated from Hayek's explanation, to be replaced by explanations couched solely in terms of individuals, because it is only when people are organised so as to form the group in question that the emergent causal power upon which Hayek's explanation rests actually exists (cf. Lawson 2012a: 346-48, 2015a: 41).

Hayek's use of the notions of a 'system' of rules, and of 'emergence', in the form of an ontologically irreducible overall order of actions that supervenes on those rules, also helps him to resolve

---

[20] Hayek's work is thus in accord with Lawson's contention that it is just as necessary to explain why, and how, social systems are maintained over time, where indeed they are, as it is to explain their transformation (1997: 263-67, 2012a: 359).

[21] Hayek's evolutionary theory is consistent with the PVRS model of evolution outlined by Lawson (2003: 110-40). Moreover, like Lawson (2012b: 7-9), Hayek ([1967] 2014: 279, 1973: 44) seeks to reconcile the creation of emergent orders with the second law of thermodynamics, which implies that the world tends towards increasing disorder, by arguing that such orders arise through the elimination of other groups by evolutionary processes. For more on this, see Lewis (2015a: 1179-85).

the second of the ambiguities in his early 1940s account of social theory. It does so by making it possible for him to clarify the relationship between the two kinds of explanation between which he equivocates there, namely the (static) analysis of the implications of a given set of social relations and the (dynamic) account of the processes through which those relations come into being. To see why, note that from the 1960s onwards Hayek frequently refers to the importance for his social theory of the "twin ideas of evolution and spontaneous order" (Hayek [1967] 2014: 299; also see Hayek [1966] 1991: 81 and 1979: 158). So far as the notion of 'spontaneous order' is concerned, Hayek writes that "for the explanation of the functioning of the social order at any one time the rules of individual conduct must be assumed to be given" (Hayek [1967] 2014: 284).[22] This is what one might call the static or synchronic account of social order, in which the social relations between people—and, more specifically, the social rules that give rise to them—act as an *explanans*. This first kind of explanation involves the social theorist providing an account of the working of the causal mechanism through which people's (inter)actions, when they are structured by a suitable set of rules, produce social outcomes of interest. And this is precisely what Hayek provides in his account of how social order is possible in decentralised market economies, where he shows how, when the competitive interaction that takes place on free markets is governed by certain formal legal rules and informal social norms, a configuration of relative prices is generated that—taken together with the background information provided by those rules—enables people to adjust their plans to one another well enough for them to have a reasonable chance of coming to fruition (cf. Lawson 2012: 361-62). But what Hayek is able to argue in the 1960s, having by then acquired the notion of structural or emergent properties, is that this causal mechanism generates an irreducible or emergent property, namely the overall order of actions, which is the trait upon which acts the dynamic process of evolutionary selection that accounts for the existence of the relevant system of rules in the first place. In this way, therefore, the category of ontologically irreducible emergent properties helps to provide the conceptual glue through which Hayek connects his (static) account of the spontaneous market order or catallaxy with his dynamic theory of evolution.

In the 1950s and especially the 1960s, then, Hayek used the ontological category of irreducible emergent properties to clarify two issues in which his earlier social theory was ambiguous, namely the sense in which social wholes can be said to be more than the sum of their parts, and the relationship between the static and dynamic aspects of social-scientific explanation (or, equivalently in his scheme of thought, between spontaneous order and evolution). As we shall see below, these ideas also arguably helped to inform developments in his theoretical psychology, which in the 1960s increasing came to portray the mind as being governed by systems of rules and as developing through a process of neuronal group selection based on the emergent property to generate actions that are well-adapted to people's circumstances.

[22] In his mature, post-1960 social theory, Hayek defines the notion of (social) order as "a state of affairs in which a multiplicity of elements of various kinds are so related to each other that we may learn from our acquaintance with some spatial or temporal part of the whole to form correct expectations concerning the rest, or at least expectations which have a good chance of proving correct" (Hayek 1973: 36). In doing so, to use Lawson's terminology, Hayek is conceptualising the notion of social order in an 'ontic' fashion, which is to say as a feature of the real world (as opposed to conceptualising it in 'theoretic' terms, that is as no more than a property of a model, as orthodox economists do in the case of the notion of equilibrium) (Lawson 2005: 429-30). The advantage that the notion of 'order' over that of 'equilibrium', Hayek contends, is twofold: first, unlike the notion of order, "an equilibrium presupposes that the facts have already been discovered and competition has therefore ceased"; and, second, again unlike the notion of equilibrium, "we can meaningfully speak of an order being approved to various degrees, and that order can be preserved throughout a process of change" (Hayek [1968] 1978: 184). For more on the notion of order in Hayek's work, see Fleetwood (1995), Lawson (2005: 438-42), Lewis (2014, 2015a: 1170-71, 2015b: 140-42).

4. **DISCUSSION AND CONCLUSION**

The account presented above suggests that the notion of emergence played an increasingly important, and also increasingly explicit, role in the arguments Hayek mounts against reductionism in his postwar work on theoretical psychology and social theory. In the case of Hayek's theoretical psychology, Hayek's most prominent argument against reductionism was computational in nature. However, we have also seen that Hayek drew on the work of the organicist biologists Ludwig von Bertalanffy and Joseph Woodger, from whom he acquired a set of concepts that afforded him the opportunity, which he did not consistently exploit, to mount a rather different, emergentist case against reductionism. More specifically, while in giving an account of the philosophical significance of his account of the mind, Hayek explicitly endorses the idea that his theoretical psychology should be interpreted using the notions of 'organisation' and 'structural' or emergent properties, he does not use those concepts to develop an explicitly 'emergentist' argument against reductionism, preferring to rely on his computational account of the inability of classificatory systems such as the mind fully to explain themselves.

In the 1960s, however, Hayek advanced a rather more explicitly 'emergentist' case against reductionism in his social theory, based on the importance of organising relations for the generation of higher-level structural properties such as the coordinative powers of the liberal market economy. Moreover, as we have seen, the increasingly sophisticated set of ontological categories at Hayek's disposal, including not only the concept of emergence but also closely allied concepts such as 'system' and 'levels of organisation', enabled him to integrate key themes in his work, in particular the notions of 'spontaneous order' and 'evolution', with the conceptual bridge connecting those ideas being provided by the idea that the coordinative power of the price mechanism is an irreducible, emergent property of the system of rules governing people's interactions. And if this claim is correct, then it implies that those commentators—such as Vanberg (1986: 97), Paul (1988: 261), and Hodgson (1993: 177)—who have called into question the compatibility of Hayek's work on spontaneous order with his evolutionary theory of group selection are mistaken.

It is also interesting to observe that, in an essay written for a conference held in 1968 on the topic of reductionism in the human sciences, Hayek took the some of the ideas he worked out in the course of elaborating his account of cultural evolution via group selection and applied them to develop his theoretical psychology beyond where it stood at the time of *The Sensory Order*.[23] In particular, Hayek now adds to his earlier portrayal of the mind as a neurological classificatory apparatus the idea that the process of classification is governed by a "system of rules of action" that "conjointly determin[e] particular actions" (Hayek [1969] 2014: 320-21). This system of rules, Hayek argues, evolves through a process of competition whereby systems of rules, and the groups of neurons in which those rules are embodied, are selected—or not, as the case may be—in virtue of their emergent capacity to classify the world, and to dispose people to act, in ways that enable a person successfully to navigate his/her environment: '[I]t is by a selection among mechanisms producing different action patterns that the system of rules of action is built up on which rests what we regard as an interpretation of the external world by the mind … As the organism plays with a great many action patterns of which some are confirmed and retained as conducive to the preservation of the species, corresponding structures of the nervous system

[23] The event in question was the Alpbach symposium, the goal of which was, fittingly enough, that of rescuing "the life sciences from … crudely reductionist philosophy" (Koestler 1969: 2).

producing appropriate dispositions will first appear experimentally and then either be retained or abandoned" (Hayek [1969] 2014: 321).

This account of neuronal group selection, whereby systems of rules—and the groups of neurons in which they are embodied—are selected according to their capacity to generate actions conducive to the welfare of the individual, is clearly analogous to Hayek's account of cultural evolution via the selection of social groups defined in terms of the systems of rules to which their members adhere. However, Hayek does not exploit the analogy between neuronal and cultural group selection as completely as he might have done. One might reasonably expect Hayek to have suggested that the trait upon which process of neuronal group selection operates is an emergent property, analogous to the 'overall order of actions', that enables the person in question to take actions that are well-suited to his or her circumstances. However, he does not do so. Moreover, whereas in his theory of cultural evolution Hayek argues explicitly that it is necessary to draw an ontological distinction between the overall actions of the group and the system of rules upon which that emergent property supervenes because "it is the resulting order of actions but not the regularity of the actions of the separate individuals as such which is important for the preservation of the group" ([1967] 2014: 280), there is no such argument advanced in the case of his theoretical psychology. Indeed, rather than mirroring the emergentist arguments he used to demonstrate the irreducibility of the overall order of actions in his social theory, Hayek in his theoretical psychology again falls back on the computational argument that the inability of an instrument of classification such as the human mind fully to understand itself renders "a complete reduction of the subjectively experienced mental qualities to exhaustively defined places in a network of physical relations … in principle impossible for us" ([1969] 1969: 326).

For all the efforts to develop a consistent emergentist, or system-theoretic, account of the mind and the market, therefore, Hayek does not succeed in fully working out all the implications of those meta-theoretical, or ontological, frameworks. In particular, although—as Hayek himself recognised—his theoretical psychology is quite consistent with emergentism, he never did develop a consistent, explicit emergentist argument against attempts to eliminate mental terms from our explanations of human conduct, preferring instead to continue to rely on the computational argument he first advanced in the early 1940s. And it is in drawing attention to aspects of Hayek's thought such as his incomplete use of emergentist arguments against reductionism that one example of how ontological thinking can contribute to the history of economic thought is to be found.

Another, closely-related contribution of ontologically-informed history of thought lies in this case in the way that, by making explicit and systematising Hayek's thinking about emergence, it makes it possible to show that Hayek's theoretical psychology is more consistent, both internally and also with his social theory, than some interpreters, less focused on ontological issues, have suggested (cf. Lawson 2015a: 32-33). For interpreted along the lines suggested by an awareness of the ontological category of 'emergence', Hayek's theoretical psychology appears closely to resemble the position variously known as *non-reductive materialism* (Bunge 1980: 6-9, 21-25; Sawyer 2002: 4-7) or, in Lawson's terminology, *emergent powers materialism* (Lawson 1997: 63, 175-77, 2003: 44-49). It is 'materialist' in the sense that it portrays the brain as consisting, ultimately, of nothing more than physical matter. (There is no distinctive mental 'stuff'.) But it is non-reductive or emergenist because it suggests that the structured interaction between those physical particles gives rise to distinctive, irreducible mental properties. As Lawson puts it, "the form of materialism to which we are committed ultimately entails the unilateral ontological dependence of social upon biological upon physical forms coupled with the taxonomic and

causal irreducibility of each to any other" (1997: 63). And, as noted in Section 2.3 above, this portrayal of Hayek's approach as emergent powers materialist or non-reductive physicalist not only coheres with his use of the organicist biologists to provide an account of the philosophical significance of his theoretical psychology, but also fits the substantive claims made in his theoretical psychology about how sensory qualities are formed. Moreover, as I have argued elsewhere, this reading of Hayek's work is afforded additional support by the fact that doing so helps to make sense of certain otherwise opaque passages in *The Sensory Order*, where Hayek discusses the merits of dualism and materialism in the philosophy of mind (Lewis 2016b: section 3.3).

Perhaps unsurprisingly, given that Hayek gave much more prominence to his computational argument against reductionism, this emergenist aspect of Hayek's theoretical psychology has eluded many commentators. For instance, in a review of *The Sensory Order*, the historian of psychology Edwin Boring highlighted what he saw as an inconsistency in Hayek's book, writing that, "all through this discussion Hayek talks like a mind-body dualist and yet presently insists that he is not" (Boring 1953: 183). The point, of course, is that Hayek is a *property* dualist, not a *substance* dualist. The fact that Hayek's property dualism is grounded in an emergent causal powers materialism that he leaves largely implicit is, of course, one reason why Boring might have found it hard to appreciate. More recently, De Vecchi has argued that "Hayek must confine himself to rejecting the dualism between mind and body but … [only] from an ontological point of view … [not] on the gnoseological [i.e., epistemological] level, that is, the level of the 'scientific explanation' of events (Hayek 1952, 4, 173, 179)" (De Vecchi 2003: 146). What the appreciation of the importance of emergence in Hayek's thinking facilitated by ontologically-informed history of thought makes it possible to see is that Hayek rejects only one form of ontological dualism, namely substance dualism, whilst affirming another form of ontological dualism, namely property dualism. Finally, Birner describes Hayek's theoretical psychology as an example of "physicalist reductionism", arguing that, "What is perhaps most surprising of all about Hayek's psychology … is that in the end it undermines his entire system of thought, except, perhaps, for his economics, which did not undergo its influence. On further analysis, Hayek's physicalist reductionism turns out to be a straightjacket that leaves no room for any active and creative role of man" (1999: 50, 78). However, if the analysis presented above is correct, then Hayek's emergentist position is quite different to physical reductionism and there is no contradiction between his theoretical psychology and his wider social and economic theory. For if the relationship between mind and body is best thought of in terms of the notion of emergence, then one can think of the causal powers of human mind—including not only its capacity to generate the phenomenal world of sensory experience but also its ability to imbue events with subjective meaning and to initiate novel courses of action—as emergent properties of the structured array of neurons found in the human brain and, therefore, as being quite compatible with Hayek's cognitive psychology. The fact that ontologically-informed history of thought can help to correct such erroneous readings of, in this case, the work of Hayek, lends support to Lawson's view that, rightly used, "ontological analysis becomes a useful tool in the history of thought" (2015b: 32).

REFERENCES

Arena, R. and T. Lawson (2015). 'Introduction.' *Cambridge Journal of Economics*, 39: 987-92.

Ashby, W.R. (1949). 'Critical Review: The Facts and Methods of Cybernetics.' *Journal of Mental Sciences*, 95: 716-24.

Bertalanffy, L. v. (1933). *Modern Theories of Development: An Introduction to Theoretical Biology*. Translated and adapted from the original, 1928 German edited by J.H. Woodger. London: Oxford University Press.

Bertalanffy, L. v. (1950). 'An Outline of General System Theory.' *British Journal for the Philosophy of Science*, 1: 134-65.

Bertalanffy, L. v. (1952). *Problems of Life: An Evaluation of Modern Biological Thought*. London: Watts & Co.

Birner, J. (1999). 'The Surprising Place of Cognitive Psychology in the Work of F.A. Hayek.' *History of Economic Ideas*, 7: 43-83.

Boring, E.G. (1953). 'Elementist going Up.' *The Scientific Monthly*, March 1953: 182-83.

Bunge, M. (1980). *The Mind-Body Problem: A Psychobiological Approach*. Oxford: Pergamon Press.

Butos, W. and R. Koppl (2006). '*Does The Sensory Order* have a Useful Economic Future?' *Advances in Austrian Economics*, 9: 19-50.

Caldwell, B. (2004). *Hayek's Challenge: An Intellectual Biography of F.A. Hayek*. Chicago and London: The University of Chicago Press.

De Vecchi, N. (2003). 'The Place of Gestalt Psychology in the Making of Hayek's Thought.' *History of Political Economy*, 35: 135-62.

Dupuy, J.-P. (2009). *On the Origins of Cognitive Science: The Mechanization of Mind*. Cambridge, MA.: MIT Press.

Elder-Vass, D. (2010). *The Causal Power of Social Structures: Emergence, Structure and Agency*. Cambridge: Cambridge University Press.

Fleetwood, S. (1995). *Hayek's Political Economy: The Socio-Economics of Order*. London New York: Routledge.

Fleetwood, S. (1996). 'Order without Equilibrium: A Critical Realist Interpretation of Hayek's Notion of Spontaneous Order.' *Cambridge Journal of Economics*, 20: 729-47.

Fleetwood, S. (2001). 'What Kind of Theory is Marx's Labour *Theory* of Value?' *Capital and Class*, 25: 41-77.

Fullbrook, E. (ed.) (2009). *Ontology and Economics: Tony Lawson and his Critics*. London and New York: Routledge.

Gaus, J. (2006). 'Hayek on the Evolution of Society and Mind.' In E. Feser (ed.), *The Cambridge Companion to Hayek*. Cambridge: Cambridge University Press.

Graça Moura, M. da (2002). 'Metatheory as the Key to Understanding: Schumpeter after Shionoya.' *Cambridge Journal of Economics*, 26: 805-21.

Graça Moura, M. da (2004). 'A Note on Critical Realism, Scientific Exegesis, and Schumpeter.' In Lewis (ed.) (2004).

Graça Moura, M. da (2015). 'Schumpeter's Conceptions of Order Process and Order.' *Cambridge Journal of Economics*, 39: 1129-48.

Hayek, F.A. ([1937] 1948). 'Economics and Knowledge.' In Hayek (2014).

Hayek, F.A. ([1942] 2010). 'Scientism and the Study of Society. Part 1." In Hayek (2010).

Hayek, F.A. ([1943] 2010). 'Scientism and the Study of Society. Part 2." In Hayek (2010).

Hayek, F.A. ([1944] 2010). 'Scientism and the Study of Society. Part 3." In Hayek (2010).

Hayek, F.A. ([1944] 2007). *The Road to Serfdom. Text and Documents: The Definitive Edition*. Edited by B. Caldwell. Chicago: The University of Chicago Press.

Hayek, F.A. ([1945] 1948). 'The Use of Knowledge in Society.' In Hayek (2014).

Hayek, F.A. (1952). *The Sensory Order: An Inquiry into the Foundations of Theoretical Psychology*. London and Henley: Routledge & Kegan Paul.

Hayek, F.A. (n.d.). 'Within Systems and About Systems: A Statement of Some Problems of a Theory of Communication.' Typescript. Hoover Institution, Hayek Archives, box 104, folder 22.

Hayek ([1962] 2014). 'Rules, Perception and Intelligibility.' In F.A. Hayek (2014).

Hayek, F.A. ([1964] 2014). 'The Theory of Complex Phenomena.' In F.A. Hayek (2014).

Hayek, F.A. ([1966] 1968). 'The Principles of a Liberal Social Order.' In F.A. Hayek (1968), *Studies in Philosophy, Politics and Economics*. London: Routledge and Kegan Paul.

Hayek, F.A. ([1967] 2014). 'Notes on the Evolution of Systems of Rules of Conduct.' In F.A. Hayek (2014).

Hayek, F.A. ([1969] 2014). 'The Primacy of the Abstract.' In F.A. Hayek (2014).

Hayek, F.A. (1973). *Law, Legislation and Liberty: A New Statement of the Liberal Principles of Justice and Political Economy. Volume I: Rules and Order*. London and New York: Routledge.

Hayek, F.A. ([1975] 1978). 'The Pretence of Knowledge.' In F.A. Hayek (2014).

Hayek, F.A. (1976). *Law, Legislation and Liberty: A New Statement of the Liberal Principles of Justice and Political Economy. Volume II: The Mirage of Social Justice*. London and New York: Routledge.

Hayek, F.A. (1979). *Law, Legislation and Liberty: A New Statement of the Liberal Principles of Justice and Political Economy. Volume III: The Political Order of a Free People*. London and New York: Routledge.

Hayek, F.A. (1982). 'The Sensory Order after 25 Years.' In W. Weimer and D. Palermo (eds.), *Cognition and the Symbolic Processes*. Hillsdale, NJ: Erlbaum.

Hayek, F.A. (2010). *The Collected Works of F.A. Hayek, Volume 13: Studies on the Abuse & Decline of Reason*. Edited by B. Caldwell. Chicago: The University of Chicago Press.

Hodgson, G.M. (2003). *Economics and Evolution: Bringing Life Back into Economics*. Cambridge: Polity Press.

Koestler, A. (1969). 'The Alpbach Symposium: Opening Remarks.' In A. Koestler and J. Smythies (eds.) (1969), *Beyond Reductionism: New Perspectives in the Life Sciences*. *The Alpbach Symposium 1968*. London: Hutchinson of London.

Koppl, R. (2009). 'Some Epistemological Implications of Economic Complexity.' *Journal of Economic Behavior and Organization*, 76: 589-72.

Latsis, J. (2015). 'Shackle on Time, Uncertainty and Process.' *Cambridge Journal of Economics*, 39: 1149-65.

Lawson, C. (1994). 'The Transformational Model of Social Activity and Economic Analysis: A Reinterpretation of the Work of J.R. Commons.' *Review of Political Economy*, 6: 186-204.

Lawson, C. (1999). 'Realism, Theory and Individualism in the Work of Carl Menger.' In S. Fleetwood (ed.), *Critical Realism in Economics: Development and Debate*. London and New York: Routledge.

Lawson, C. (2015). 'Order and Process in Institutionalist Thought: Commons and Ayres.' *Cambridge Journal of Economics*, 39: 1153-69.

Lawson, T. (1995) 'Economics and Expectations.' In S.C. Dow and J. Hillard (eds.) *Keynes, Knowledge and Uncertainty*. Aldershot: Edward Elgar.

Lawson, T. (1996). 'Keynes and Hayek: A Commonality', *History of Economics Review*, 25: 96-114.

Lawson, T. (1997). 'Development in Hayek's Social Theorising.' In S. Frowen (ed.), *Hayek the Economist and Social Philosopher: A Critical Retrospect*. Basingstoke: Macmillan.

Lawson, T. (1997). *Economics and Reality*. London and New York: Routledge.

Lawson, T. (2003a). *Reclaiming Reality*. London and New York: Routledge.

Lawson, T. (2003b). 'Keynes's Realist Orientation.' In J. Runde and S. Mizuhara (eds.), *The Philosophy of Keynes's Economics: Probability, Uncertainty and Convention*. London and New York: Routledge.

Lawson, T. (2005). 'Reorienting History (of Economics).' *Journal for Post Keynesian Economics*, 27: 455-71.

Lawson, T. (2006). 'The Nature of Heterodox Economics.' *Cambridge Journal of Economics*, 30: 483-505.

Lawson, T. (2012a). 'Ontology and the Study of Social Reality: Emergence, Organisation, Community, Power, Social Relations, Corporations, Artefacts and Money.' *Cambridge Journal of Economics*, 36: 345-85.

Lawson, T. (2012b). 'Emergence, Morphogenesis, Causal reduction and Downward Causation.' In M. Archer (ed.), *Social Morphogenesis*. New York: Springer.

Lawson, T. (2015a). 'A Conception of Social Ontology.' In S. Pratten (ed., 2015), *Social Ontology and Modern Economics*. London and New York: Routledge.

Lawson, T. (2015b). *Essays on the State and Nature of Modern Economics*. London and New York: Routledge.

Lawson, T. (2015c). 'Process, Order and Stability in Veblen.' *Cambridge Journal of Economics*, 39: 993-1030.

Lewis, P.A. (2003). 'Recent Developments in Economic Methodology: The Rhetorical and Ontological Turns.' *Foundations of Science*, 8, pp. 51-68.

Lewis, P.A. (2004). 'Transforming Economics? On Heterodox Economics and the Ontological Turn in Economic Methodology.' In Lewis (ed.) (2004).

Lewis, P.A. (ed.) (2004). *Transforming Economics: Perspectives on the Critical Realist Project*. London and New York: Routledge.

Lewis, P.A. (2008). 'Solving the 'Lachmann Problem': Orientation, Individualism and the Causal Explanation of Socio-Economic Order.' *American Journal of Economics and Sociology*, 67: 827-57.

Lewis, P.A. (2012). 'Emergent Properties in the Work of Friedrich Hayek.' *Journal of Economic Behavior and Organization*, 82: 368-78.

Lewis, P.A. (2014). 'Hayek: From Economics as Equilibrium Analysis to Economics as Social Theory.' In R. Garrison and N. Barry, eds., *Elgar Companion to Hayekian Economics*. Cheltenham: Edward Elgar.

Lewis, P.A. (2015a). 'Notions of Order and Process in Hayek: The Significance of Emergence.' *Cambridge Journal of Economics*, 39: 1167-90.

Lewis, P.A. (2015b). 'An Analytical Core for Sociology: A Complex, Hayekian Analysis.' *Review of Behavioral Economics*, 2: 123-46.

Lewis, P.A. (2016a). 'The Emergence of "Emergence" in the Work of F. A. Hayek.' *History of Political Economy*, 48: 111-50.

Lewis, P.A. (2016b). 'Systems, Levels of Organisation and Structural Properties: The Influence of Ludwig von Bertalanffy on the Development of the Work of F.A. Hayek.' *Research in the History of Economic Thought and Methodology*, 34A: 125-59

Lewis, P.A. (2016c). 'Purposeful behaviour, Expectations, and the Mirage of Social Justice: The Influence of Cybernetics on the Thought of F. A. Hayek.' Working paper, Department of Political Economy, King's College London. Available online at: https://papers.ssrn.com/sol3/papers.cfm?abstract_id=2790169 (accessed 6th January 2017).

Lewis, P.A. (2016d). "The Origins of Hayek's 'Model': The Significance of Kenneth Craik." Unpublished paper, Department of Political Economy, King's College London.

Lewis, P.A. (2017). 'Shackle on Choice, Imagination and Creativity: Hayekian Foundations.' *Cambridge Journal of Economics*, 41: 1-24.

Lewis, P.A. and J.H. Runde (2007). 'Subjectivism, Social Structures and the Possibility of Socio-economic Order.' *Journal of Economic Behavior and Organization*, 62: 167-86.

Martins, N. (2015). 'Interpreting the Capitalist Order before and after the Marginalist Revolution.' *Cambridge Journal of Economics*, 39: 1109-27.

McCulloch, W. and W. Pitts (1943). 'A Logical Calculus of the Ideas Immanent in Nervous Activity.' *Bulletin of Mathematical Biophysics,* 5: 115–133.

Mirowski, P. (2007). 'Natuaralizing the Market on the Road to Revisionism: Bruce Caldwell's *Hayek's Challenge* and the Challenge of Hayek Interpretation.' *Journal of Institutional Economics*, 3: 351-72.

Montes, L. (2003). 'Smith and Newton: Some Methodological Issues Concerning General Equilibrium Theory.' *Cambridge Journal of Economics*, 27: 723-47.

Nagel, E. and J. Newman (1958). *Gödel's Proof*. New York: New York University Press.

Paul, E.F. (1988). 'Liberalism, Unintended Orders, and Evolutionism.' *Political Studies*, 36: 251-72.

Pratten, S. (1993). 'Structure, Agency and Marx's Analysis of the Labour Process.' *Review of Political Economy,* 5: 403-26.

Pratten, S. (1998). 'Marshall on Tendencies, Equilibrium and the Statical Method.' *History of Political Economy,* 30: 121-63.

Rosser, J. B. (2015). 'Complexity and Austrian Economics.' In P. Boettke and C. Coyne (eds.), *The Oxford Handbook of Austrian Economics*. Oxford: Oxford University Press.

Runde, J. (1988). "Subjectivism, Psychology and the Austrians." In P. Earl (ed.), *Psychological Economics: Developments, Tensions, and Prospects*. Boston: Kluwer.

Runde, J. (2001). 'Bringing Social Structure Back into Economics: On Critical Realism and Hayek's *Scientism* Essay.' *Review of Austrian Economics,* 14: 5-24.

Sawyer, R. K. (2002). 'Emergence in Psychology: Lessons from the History of Non-Reductionist Science.' *Human Development,* 45: 2-28.

Vanberg, V. (1986). 'Spontaneous Market Order and Social Rules.' *Economics and Philosophy,* 2: 75-100.

Vaughn, K.I. (1999). 'Hayek's Implicit Economics: Rules and the Problem of Order.' *Review of Austrian Economics*, 11: 128-44.

Woodger, J. (1929). *Biological Principles*. London: Kegan Paul, Trench, Trubner & Co., Ltd.